

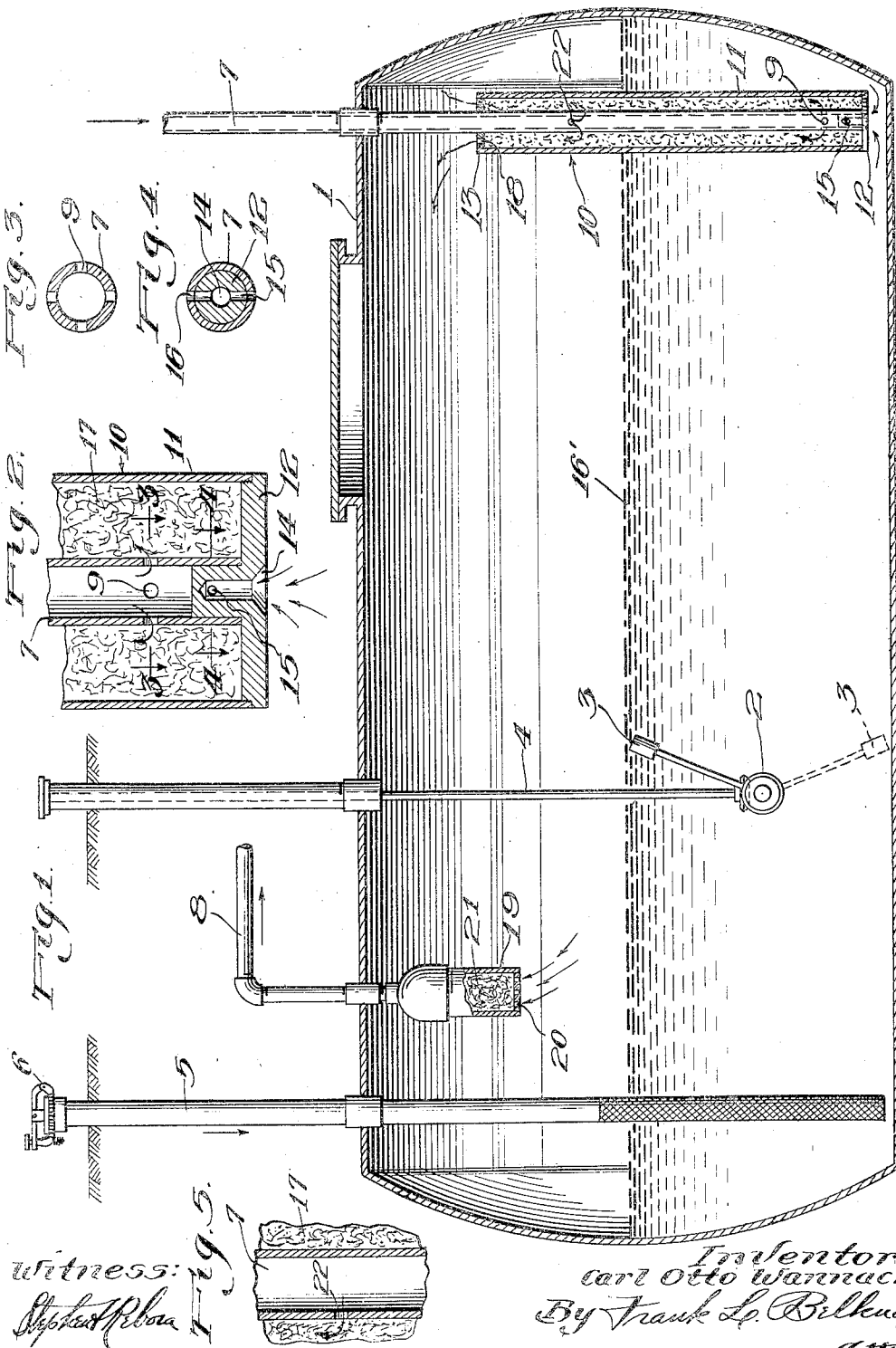
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METHOD OF GENERATING A COMBUSTIBLE GAS

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METHOD OF GENERATING A COMBUSTIBLE GAS

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This is a division of my application Serial No. 299,787 filed August 15th, 1928.

My invention relates to a process for making gas, and refers more particularly to the production of gas from a volatile hydrocarbon, such as gasoline or the like, by breaking up and bringing the air and hydrocarbon into intimate relation with each other whereby a combustible substantially fixed gas is formed.

An object of my invention is to supply a great demand for a self-contained automatic gas generating machine which provides a complete plant for installment in districts remote from and/or not supplied with natural or manufactured gas from a central gas station, particularly for domestic use, for stoves, house heating and the like.

Another object of my invention is the provision of a process for making a combustible gas from a volatile hydrocarbon which is simple in operation, effective in service and safe for use without the danger of explosion resulting from flash backs from the burner or combustion from other accidental causes.

A still further object of my invention is to provide a process for making a combustible gas which is substantially non-asphyxiating.

Various attempts have been made to supply the demand for a self-contained automatic gas generating machine by apparatus where air is passed through gasoline and in passing through the gasoline the air converts or picks up some of the gasoline in the shape of vapors, thus forming a gasoline-vapor gas. These machines have not proved satisfactory for the reason that gasoline is a mixture of hydrocarbons having a wide range of boiling points, and in the passage of air through such gasoline to make gas the air invariably picks up the lighter ends of the gasoline with the result that it leaves a residue of the higher boiling point portions of the gasoline.

Gas made in the above manner becomes poorer in quality, and finally so poor, because

of the volume of air to gasoline vapors, that it will no longer burn.

Further, during the period from the production of the best gas to the production of the poorer gas, the quality of the gas is changing; hence, said air mixture at the burner is not suitable for this range of difference in the richness or leanness of the gasoline vapors in the mixture.

By actual trials I have succeeded in making a uniform mixture of the air-gasoline gas by forcing air and gasoline through a substance functioning to minutely divide the air and gasoline into finely divided condition and thoroughly and intimately mix the two to produce a stable gas of uniform quality. The process is so carried out that the air will not rob the gasoline of its lighter ends. In other words, the combustible gas produced by the present invention is substantially uniform, i. e., for all practical purposes, during the entire consumption of the gasoline.

Briefly describing the operation of the invention, air under a slight superatmospheric pressure is forced to the base of a stationary conduit where it discharges into an enclosed chamber filled with means for breaking up the air into finely divided particles. This latter chamber is submerged in the gasoline, having a communication therewith through an opening disposed at a point below the point at which the air is introduced to said mixing chamber. In the ascent of the air through the mixing chamber, liquid from the combustible liquid body in which the mixing chamber is submerged will siphon into the mixing chamber at the base thereof through the opening heretofore described. Thus, the air discharging from the charging pipe into the mixing chamber will pick up a certain amount of the liquid siphoning into said mixing chamber through said lower inlet. The head of liquid in the mixing chamber will at no time exceed a predetermined high point, nor go below a predetermined

low point. Thus, the air is caused to traverse at all times a known limited volume of liquid hydrocarbon which at all times comprises a substantially uniform mixture of the different boiling point constituents of the main body of hydrocarbon. Since the inlet to the mixing chamber is at all times submerged in the body of liquid hydrocarbon, the liquid siphoning from said main body into the mixing chamber will be a representative uniform sample of the liquid in the main bulk supply. The range of possible difference in relative richness or leanness of the gas produced at the highest and at the lowest level is preferably controlled so that it is within a range permitted for practical purposes.

The utility of the invention as well as other objects and advantages will be more fully and better understood by reference to the accompanying drawing, in which

Fig. 1 is an elevational view, partly in vertical section, of means for carrying out the invention.

Fig. 2 is an enlarged fragmentary vertical sectional view showing the lower end of the mixing chamber and the relative positions of the air inlet and liquid inlet to the mixing chamber.

Fig. 3 is a cross sectional view taken on line 3-3 of Fig. 2.

Fig. 4 is a cross sectional view taken on line 4-4 of Fig. 2.

Fig. 5 is an enlarged fragmentary vertical sectional view taken intermediate the height of the air charging pipe and illustrating the opening in said pipe for admitting air at a point above the liquid level of the chamber for purposes of dilution.

Referring more in detail to the drawing, 1 illustrates a tank which may be located for the purpose of safety beneath the surface of the ground and which may be supplied with gasoline or other volatile hydrocarbon to be used until the level rises say to the half way point so that the tank is approximately half full. This is for illustration only, and the level to which the tank is filled may be materially above or below the half way point. The numeral 2 represents a valve actuated by a float 3 of standard design to control the maximum amount of gasoline or other volatile hydrocarbon which can be charged into the tank 1. The valve 2 communicates with a gauge 4, which can be viewed by the operator as the tank is being filled. The gasoline or other volatile hydrocarbon may be charged to the tank 1 through the charging pipe 5 provided with a standard spring tensioned cap 6.

Air under a few pounds superatmospheric pressure is charged to tank 1 through the line 7. The line 7 communicates with a conventional type of air compressor (not shown) which may be operated by a conventional type motor through the medium of a belt

or pulley, which motor may be automatically controlled by a conventional type of pressure electric control switch, set to operate the pump to maintain a predetermined pressure on the tank 1. When the pressure in the tank reaches this predetermined point, it causes the automatic electric switch to disengage, thus temporarily shutting off the motor. When the pressure drops below a predetermined amount it causes the electric control switch to again make contact to start the motor and place the latter again in operation.

The gas outlet line 8 establishes communication between the electric switch (not shown) and the liquid-free space above the liquid within the tank. The motor causes the discharge of air under pressure through line 7, which in the present instance takes the form of a stationary upright conduit projecting into the tank 1 through the upper wall thereof. The air charged through the conduit 7 discharges therefrom at a point adjacent its lower end through the orifices or holes 9 into the interior of a mixing chamber 10 surrounding said pipe 7 for a great part of its length within the tank 1. The mixing chamber 10 comprises an enlarged conduit 11 closed at its base by means of the cap 12 and at its upper end by means of the cap 13. It is to be particularly noted at this point that the orifices 9 through which the air discharges from the conduit 7 into the interior of the mixing chamber 10 are located a short distance above the lower end of said conduit 7. Directional baffles or fins tapering upwardly may be disposed immediately below the holes 9 to insure that the air discharging through said holes 9 into the chamber 10 will ascend and not descend.

The bottom closure cap 12 may be centrally recessed at 14 upwardly for a short distance, terminating in the branch ducts 15, which in turn communicate with ducts 16 in the wall of the conduit 7 a short distance below the holes 9. In this manner, air introduced under pressure through the conduit 7 will discharge through the holes 9 into the mixing chamber 10, and in ascending therethrough will cause liquid from the liquid body 16' to siphon into the recess 14 and through the ducts 15 and holes 16 into the mixing chamber 10. The ascent of the air will exert sufficient force to carry the liquid upwardly in the mixing chamber 10 whereby the air and gasoline are brought into intimate contact. Steel wool or other suitable material 17 accomplishing this purpose, may be packed in the mixing chamber 11 whereby the air and gasoline are broken up and reduced to finely divided condition.

In the drawing, the level of liquid in the tank 1 is indicated at its high point. Thus, when air is not being introduced through the conduit 7 through the automatic operation of the compressor pump as heretofore described,

the liquid level in the mixing chamber will be at a high point at the same level as the level of the main bulk supply 16'. As the level of liquid recedes through use, the level of the liquid in the mixing chamber 10 likewise recedes to a low point previously determined to be the point at which it would be inadvisable to permit a lower level due to change in richness or leanness of the gas.

While I have not illustrated it in the drawing, suitable means may be provided for automatically shutting off the motor permanently when the liquid has reached a predetermined low level, the arrangement being such that the motor and pump can again be placed in operation only when the bulk supply 16' is replenished. Thus, there is always a column of liquid within the mixing chamber 10 of a known volume, predetermined to be the correct volume for the production of the best gas. This volume is computed beforehand and the difference in volume between the high and low levels is regulated so that any possible variation in leanness or richness of the resulting gas is within permissible variations.

The steel wool or similar substance packed in the mixing chamber 11 tends to break up and finely divide the air and gasoline in their ascent through the mixing chamber. In addition, any entrained liquid particles will be cut and removed from the air-gasoline mixture before said mixture discharges as a gas through the holes 18 in the closure cap 13. Gas discharging through said closure cap 13 into the free space above the liquid level passes over to a bell-shaped scrubber 19 having orifices 20 through which the gas passes to the line 8. Steel wool or other suitable material 21 may be packed in the scrubber 19 to remove any entrained liquid which may still be in the gas, thus making a dry gas. As the mixture passes through the scrubber 19 it is still further broken up into finely divided condition and thoroughly mixed, any gasoline not thoroughly mixed draining back into the tank 1.

It will be seen from the foregoing that the apparatus is automatically maintained at a predetermined suitable pressure, say 3 pounds per square inch, more or less. The burners are shut off and, of course, the automatic electric switch has been disengaged due to the pressure raising to a predetermined point, which interrupts the operation of the motor and air compressor and everything is in a quiescent state. If gas is wanted at the kitchen stove, for instance, the usual gas valve is opened and this starts the flow of gas from the container 1 through the various lines into the burner, causing the pressure to gradually drop. When the pressure drops below the minimum, it causes the electric control switch previously described to engage, which in turn places the motor and air compressor in operation, thus forcing air

through pipe 7 and into the mixing chamber 10, the air in ascending therethrough causing liquid to siphon through the ducts 15 and holes 16 into the mixing chamber 10, at the same time causing both the air and liquid to be thoroughly broken up and completely mixed. This mixture continues to ascend through the mixing chamber and through the space above the liquid supply 16' where it is freed of any unmixed liquid gasoline in passing through the scrubber 19, after which the dry gas passes through the line 8 to the burner. If the compressor not shown is greater in air capacity than the volume of gas consumed, then the pressure generated in tank 1 will in time reach the predetermined point of, say 4 pounds per square inch, more or less, at which time the compressor will be automatically interrupted, which interruption will continue until the consumption of gas will have reduced the pressure below, say $1\frac{1}{2}$ pounds per square inch, at which time air will automatically be forced through the pipe 7.

As a rule, what is known as casing head gasoline is used in plants of this character, although a heavier gasoline may be used. If a very light casing head gas is used and the gas is too rich, this can be corrected by increasing the pressure on tank 1. If the gas is too lean, this can be corrected by decreasing the pressure. It is essential that the gasoline and air, after admixture, have sufficient travel through conduits filled with steel wool or other suitable material to insure their breaking up into minute particles and being thoroughly and uniformly mixed.

I have illustrated in Figs. 1 and 5 an additional hole 22 disposed intermediate the length of the conduit 7 at a point above the high point of the liquid level of the bulk supply 16'. This is to permit a predetermined amount of the air being charged through the conduit 7 to be mixed with the gas being made by the process for the purpose of dilution. It is to be understood that I have just shown this diagrammatically. It may be omitted altogether where the other conditions of operation are carefully controlled to produce a gas of the desired B. t. u. value. In addition, it may be made adjustable so as to increase or decrease the amount of air permitted to mix with the gas for the purposes of dilution. The mechanism and method of controlling this increase or decrease is within the skill of those versed in this art.

One of the important advantages of the invention is that I eliminate agitation in the main body of liquid hydrocarbon, the liquid siphoning from the main body into the carburetor through the bottom thereof, and all agitation occurring only in the carburetor. Thus, no detrimental washing of newly

formed gas by causing same to pass through the main body of liquid takes place.

I claim as my invention:

A method of generating combustible gas, which comprises maintaining a bulk supply
5 of volatile hydrocarbon liquid under pressure within a closed zone, isolating a portion of said liquid, introducing air under pressure through a single inlet and intimately
10 contacting a portion of the air with the liquid in said isolated portion to form a combustible gas, and diverting another portion of said air within said closed zone out of contact with the isolated portion of liquid to dilute the combustible gas.

15 In testimony whereof I affix my signature.
CARL OTTO WANNACK.

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